

Zero Retries issue 0215 2025-08-15

Zero Retries is an independent newsletter promoting technological innovation in and adjacent to Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Radios are computers - with antennas! Now in its fifth year of publication, with ~~3000~~+ 3100+ subscribers.

About Zero Retries

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Web version: <https://www.zeroretries.org/p/zero-retries-0215>

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In this issue:

Request To Send

- Paid Subscribers Update
- 3100 Email Subscribers (100+ in One Week)
- N8GNJ Now a Member of the M17 Foundation Advisory Committee
- Zero Retries Interesting Calendar for 2026 is Already Filling Up
- Weekends Are For Amateur Radio!

Zero Retries Digital Conference 2025 Update - 8/15/2025

- Registration
- Hospitality
- Sponsors
- Door Prizes
- Conference Links

What's New at Digital Library of Amateur Radio & Communications — August 2025

LinHT - Technological Innovation In Amateur Radio

A Modest Proposal

Thought Experiment - The Amateur Radio Future Systems Skunkworks

Thought Experiment About Mesh Networking

- Hard Lessons Learned - What Not To Do
- Meshtastic Is Rediscovering Lessons (Already Learned) of Amateur Radio Data Networking
- Common Point of Failure with Most Radio-based Mesh Networking
- ka9q-radio - "Receive It All"
- KA9Q Comments
- In Conclusion...

ZR > BEACON

- AMSAT-CA Quietly Comes to Life
- Brief Report from AREDN Team at DEFCON 2025

- CQ Digital Connection Columnist Don Rotolo N2IRZ “Returns” to “Print”
- New Features Being Put in CS7000 M17 GPS and CS7000 M17 PLUS Radios
- Candidate for US Congress Focuses on Issues Related to Amateur Radio

Comments Summary From Previous Issue

Zero Retries Boilerplate

Permission for Reuse of Zero Retries Content

Keywords for this Issue

Footnotes for this Issue

Comments for This Issue (redirect to Comments page)

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Paid Subscribers Update

My thanks to **Phil Karn KA9Q** for upgrading from a free subscriber to Zero Retries to **Founding Member Subscriber 0017** this past week!

Founding members are listed in every issue of Zero Retries!

My thanks to **Prefers to Remain Anonymous 10** for *renewing* as an **Annual Paid Subscriber** to Zero Retries this past week!

My thanks to **Prefers to Remain Anonymous 43** for *renewing* as an **Annual Paid Subscriber** to Zero Retries this past week!

My thanks to **Alex Free N7AGF** for *upgrading* from a **Paid Subscriber** to an **Annual Paid Subscriber** this past week!

My thanks to **Ken Hopper N9VV** for *upgrading* from a free subscriber to Zero Retries to an **Annual Paid Subscriber** this past week!

My thanks to **Prefers to Remain Anonymous 90** for *upgrading* from a free subscriber to Zero Retries to an **Annual Paid Subscriber** this past week!

My thanks to **Prefers to Remain Anonymous 91** for *upgrading* from a free subscriber to Zero Retries to an **Annual Paid Subscriber** this past week!
PTR 91 also included this nice note:

I'm a recent subscriber (starting with Issue 0210) and have just caught up with all the received issues to date (0214). I've enjoyed them all and want to support you in your efforts.

My thanks to **Kevin Dimick KN6IIW** for becoming a *new* **Annual Paid Subscriber** to Zero Retries this past week!

On [KN6IIW's QRZ page](#), there was this *hilarious...and definitely Zero Retries Interesting / Funny* photo:



Image courtesy of Kevin Dimick KN6IIW

Financial support from Zero Retries readers is a significant vote of support for the continued publication of Zero Retries.

3100 Email Subscribers (100+ in One Week)

Wow, that was fast! Zero Retries is now at 3100+ email subscribers, a 100+ increase in just one week. That's not the fastest such increase in Zero Retries history, but it's one of the fastest.

Thanks again, [Ham Radio Workbench podcast crew](#), which seems to be the source of the majority of these new subscriptions even two weeks later.

N8GNJ Now a Member of the M17 Foundation Advisory Committee

I, and several others have been unofficial advisors to the M17 Foundation and Wojciech Kaczmarek SP5WWP for some time.

In the wake of G4KLX's removal of support for M17 in his MMDVM, and the recovery effort that ensued (very successfully, as it turns out), we collectively decided that it was appropriate to make our role as an Advisory Committee more public.

M17 Foundation Advisory Committee:

Bruce Perens, K6BP

Steven Stroh, N8GNJ

James Ancona, N1ADJ

Thomas Early, N7TAE

Silvano Seva, IU2KWO

Speaking solely for my perspective on this role is that I offer my independent, “big picture ” perspective on M17 (Project and Foundation), related technologies, and M17’s future development.

I’m honored to be in such good company, and honored to support M17 Foundation and its ongoing work in expanding technological innovation in Amateur Radio.

Zero Retries Interesting Calendar for 2026 is Already Filling Up

Tina’s and my “Zero Retries Interesting” calendar for 2026 is already filling out. Open Sauce 2026 and DEFCON 2026 are both on the short list thanks to glowing reports of the “geek immersion” experience at both (see ZR > BEACON this issue regarding the latter). And quite possibly GRCon 2026. By the time of those events, we’ll have ZRDC 2026 much better dialed in than we did in starting ZRDC 2025 from scratch about five months in advance. Knowing what we know now, planning a conference is easy... *if you start working on it a year in advance*. (Or, at least that’s what it seems like to me, watching Tina work feverishly on ZRDC 2025.)

Weekends Are For Amateur Radio!

This weekend is mostly reserved for a neighbor’s all-year-in-the-making backyard party (it’s a pretty big backyard, including a pretty good band) that we’re looking forward to. The Pacific Northwest weather pattern has returned briefly to begin replenishing our aquifers and restoring our dry vegetation. Thankfully we’ve avoided major wildfires in the Pacific Northwest to date, and looks like we’re on track to run the whole house air conditioning for about 24 hours this entire Summer. We still have ample good sunny days ahead of us through the end of September, but not the weeks-long stretches of sunshine that we’ve enjoyed until now.

Have a great weekend, all of you co-conspirators in Zero Retries Interesting Amateur Radio activities!

Steve N8GNJ

Leave a comment

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Zero Retries Digital Conference 2025 Update - 8/15/2025

By Tina Stroh KD7WSF

This is the fourth in a series of weekly updates leading up to Zero Retries Digital Conference 2025. ZRDC 2025 occurs in four weeks!

Registration

There is a New Registration Option! Every once in a while, Steve comes up with a good idea, and this just happens to be one of them. As Steve was being asked to be a speaker for a club in California, he thought about issuing a club ticket. So, I created two versions of the club ticket; one for virtual attendance on the day of the conference and one for the early release of the video. It is a one ticket price, regardless of how many are participating.

Registrations still appear to be coming in slow with Constant Contact reporting 29 days until the conference. Oh, heaven help me, that seems so long but so short as well. Registration totals to date are 13 in-person registrations and 11 virtual tickets. If you are planning on attending in person, please do so by September 5th as I will need to give the venue a head count for meals. Although we can accommodate the day of registrations, *it will not include meals* and we don’t want to turn anyone away. So, please register ASAP.

Hospitality

The Zero Retries conference page has been updated with additional sights in the greater Seattle area and pictures of our support staff.

Sponsors



Image courtesy of CentyLab

Zero Retries welcomes [CentyLab](#) to our list of ZRDC 2025 sponsors. CentyLab is a small electronics lab working on multiple projects related to USB-C Power Delivery from Salem, Oregon. Their products are geared toward the open-source community, meaning they publicly disclose design files, firmware and also 3D models. They have been generous to pledge three (3) [PocketPD HW1.1](#) units, three (3) [PPSTrigger V1.2](#) units and three (3) [PPSTrigger V2.2](#) units. CentyLab will have an in-person booth at ZRDC 2025. Visit their website at [centylab.com](#).

Door Prizes



Image courtesy of ARRL

This week, in addition to the pledge from CentyLab, I have received the gift certificate door prizes from the ARRL .

Conference Links

[Registration for ZRDC 2025](#)

Zero Retries Digital Conference 2025

Zero Retries Newsletter

Please check the Conference page on the Zero Retries Webpage regularly for up to the minute news.

In closing for this week, we would like to thank our sponsors for their gracious donations:

- ARDC
- ARRL
- CentyLab
- Connect Systems
- GigaParts
- HydraSDR

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What's New at Digital Library of Amateur Radio & Communications — August 2025

By Kay Savetz K6KJN

Internet Archive's Program Manager, Special Collections

My hunt for packet radio history (which I wrote about in detail last month) continues to reveal unexplored rabbit holes.

This week DLARC added two late-1970s documents from the Defense Advanced Research Projects Agency, documents that had never been available to the public before. They show U.S. government contractors' earliest experiments in digitizing and transmitting speech using packet radio: the great-grandfather to modern digital radio modulation modes like M17.

First, [AO 3243 SRI, Packet Radio Speech Experimental Program](#). This 1977, 282-page, proposal presents a year-long program for research in digitized packet speech communication systems. SRI International participated in the initial ARPAnet speech transmission experiments and implemented voice communication capability on the PRnet, and proposed further research to determine the capacity of the PRnet to support speech traffic in addition to data traffic "in a tactical environment where mobile radios are used for conversations with several other individuals."

A second document, [AO 3549 NAC \(Kahn\), Packet Radio Program](#), shows how Network Analysis Corporation proposed to investigate combining data and digital voice transmission over packet radio. The computer hardware for running tests was a Control Data 6600 computer; the language was Fortran. The budget was more than \$200,000.

Getting these documents involved a Freedom Of Information Act request to the National Archives at College Park, Maryland. Once they determined that the material was unclassified, I sent a colleague (who first needed to obtain a researcher access number) to College Park to photocopy the files. Finally, they went to the Internet Archive scanning center to be digitized.

Another related document that I requested (AO 3243 Packet Speech Experimental Program, approximately 400 pages) "requires additional review for information protected from release under the FOIA." The next sentences of government-speak made me laugh to keep from crying: "Your request does not exceed 700 pages, so it is assigned to our first-tier processing queue. Taking into consideration our existing backlog, we estimate it will take 39 months to complete processing." So maybe, *maybe*, in three years we'll get to see that other document.

In other news, I've added a [new collection for issues of AMSAT Newsletter and AMSAT Journal](#), publications of The Radio Amateur Satellite Corporation. We have a smattering of issues, with lots of gaps to fill. The earliest issue we have is from March 1972, but that's Volume IV, so presumably the publication started in 1969, the year the organization was founded.

In March I mentioned that I added 41 issues of the [Titusville \(Florida\) Amateur Radio Club](#) newsletter. We've scanned a bunch more of their newsletters (its name has changed over the years, including Titusville Communicator and TARC News) and are up to 236 issues, going back to 1988. Meanwhile, from the other coast, we've added 200+ issues of The Radio Club of Tacoma (Washington) "Logger's Bark" newsletter. Now we host every issue of their newsletter from 1963 through today.

Turning to software for a moment. One of my favorite other ARDC-funded projects is [Radio Catalog: Ham Radio Software Preservation and Restoration](#). I hear that they're about finished with that project, having preserved the source code to a bunch of long-standing ham radio software. They've put the recovered code up [on GitHub](#) for programmers and hackers, and they also send the original, unmodified source code to DLARC. As a result, we just added the code for [xwefax](#) (Wefax and Radiofax images on Linux), [xritty](#) (for communications in the RTTY digital mode), [ARIM](#) (Amateur Radio Instant Messaging), [vARIM](#) (GUI host mode program for the VARA HF Modem), [gARIM](#) (a GUI for ARIM), [rmmsgw](#) (Winlink2000 RMS Gateway for Linux), and [DPBOX](#) (amateur packet radio mailbox). To a certain brand of radio software hacker, these are seven new shiny gold bars recovered from the depths.

What's next? In September, I plan to visit the [SPARK Museum of Electrical Innovation](#) in Bellingham, Washington: the museum is culling some of its radio books and magazines, and I'll get to sort through the material to choose what will be added to the DLARC library. From there, I'll head to the Zero Retries Digital Conference in Everett, Washington where DLARC will have an informational booth and I'll give a presentation.

There will also be: The Box. A donation box where the Zero Retries crowd can donate items to be added to DLARC. What printed or magnetic media items do you have that you'd like to see digitized and made available to the world? I invite folks to donate their QSL card collections, old logbooks, ham radio newsletters and product catalogs, and software on floppy disks. Don't forget the [DLARC Wantlist](#), the ever-changing list of DLARC's most-desired material. The Wantlist includes early issues of [A5 The Amateur Television Magazine](#), certain issues of Tom Arvo's [Digital Digest newsletter](#), certain editions of [FM ATLAS by Bruce F. Elving](#), [AMRAD newsletter](#), [AMSAT newsletter](#), and certain issues of [AMSAT Amateur Satellite Report](#). And any/all issues of Amateur Radio Trader — we have permission to publish them all, but have precious few issues, including [this just-added one from 1997](#). If any of those things appeared in The Box, that would be an incredible gift to DLARC.

Next month I'll tell you about the 9 pallets (!) of vintage tech manuals that just arrived at the scanning center.

Digital Library of Amateur Radio & Communications is funded by a generous grant from Amateur Radio Digital Communications (ARDC) to create a free digital library for the radio community, researchers, educators, and students. If you have questions about the project or material to contribute, contact me at kay@archive.org.

DLARC want list: <https://archive.org/details/dlarc-wantlist>

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LinHT - Technological Innovation In Amateur Radio

By Steve Stroh N8GNJ

*The development of the LinHT feels to me like the initial rumblings of an earthquake that eventually creates a tsunami. In short, **LinHT is gathering significant momentum**. There are moments when technology seems to leap ahead of the (assumed) state of the art, to the point where “experts” pontificate that such leaps are “just a passing fad” or dismiss the emergence of a disruptive technology because it came from an unexpected source. A few such examples of “disruptive technology” that come readily to mind are microcomputers (versus minicomputers and mainframes), Linux (versus UNIX and Windows), Starlink (versus GEO satellite-based broadband Internet), etc. I think a number of trends are converging such that we're approaching a “disruptive technology” moment with the nascent development of the **LinHT (Linux Handie Talkie)**.*

Amateur Radio has had implementations of usable Software Defined Radio (SDR) for more than a decade now. One example is the [SDR-1000](#) that “accidentally” formed FlexRadio. Another was the TAPR High Performance Software Defined Radio (HPSDR) project.

Another example is the early history of [GNU Radio](#), which was cofounded by John Gilmore W0GNU and Eric Blossom K7GNU, and the first practical hardware designed for the potential of GNU Radio - the Universal Software Radio Peripheral (USRP)[1](#) created by Matt Ettus N2MJI who went on to form [Ettus Research](#).

The revolutionary capability of SDR is that it allows the “transmitted over the air” waveform, and conversely, the decoding of such waveforms, to be defined entirely in software. Want a signal with a bandwidth of exactly 37 kHz? For a Software Defined Radio, no problem.

But there are three problems, to date, with SDR in Amateur Radio.

1. SDR implemented by commercial companies are largely “black box” implementations. With the notable exception of FlexRadio allowing user software to be run inside their latest FlexRadio 8000 and Aurora series radios, other major vendors of “SDR” radios do not allow *their* “SDR” to be accessed or functionality changed by user software. Thus innovation in making use of SDR techniques in popular “SDR” radios is at the whim (and slow pace of innovation) of those manufacturers.
2. SDR implementations to date have largely replicated existing (hardware-based) radio technology - just implemented with the better technology of SDR. Examples include more sensitive receivers, better filtering of extraneous noise, etc. Use of SDR units is still largely “one frequency at a time” with a few minor, ancillary improvements such as bandscope, diversity receivers, remote operation, etc.
3. No commercial vendor has embraced the challenge of creating a Software Defined Radio for use on Amateur Radio VHF / UHF bands (at usable transmit power levels).

But I think all of that is about to change, thanks to the prescient development of the LinHT to address those issues in an unconventional, “disruptive technology” manner.

I don't want to give the impression that I'm seeing the potential of LinHT unfold solely from my own perspective. I'm also guided by the public statements of M17 Foundation and Bruce Perens K6BP (see below). I've been given some behind-the-scenes information, *provided by multiple sources*, and without disclosing confidential information, I can state that there is *significant* interest in the potential of LinHT by several commercial entities.

The most “official” information about LinHT is at <https://github.com/M17-Project/LinHT-hw>. But reading that page doesn't really give you a sense of the potential of LinHT. This blog post on the M17 Project website does better:

[An update on LinHT \(OpenHT v2\) development process:](#)

Our printed circuit board is supposed to fit inside a Retevis C62, replacing its mainboard. We intend to use the radio's original battery. PCB design by [Vlastimil OK5VAS](#) (work in progress).

...

One of the best things of our design is that the System on Module used runs Linux and you can SSH onto it through USB-C connector (it enumerates as an *RNDIS/Ethernet Gadget*). You can basically drag-and-drop your [GNU Radio] flowgraph and completely redefine your radio or add new capabilities to it. How cool is that? If that's not enough for you – the SoM includes a Neural Processing Unit with TensorFlow Lite support that should be enough to enhance Codec 2 decoding process.

But the best description of the potential of LinHT I've read to date is the following except [by Bruce Perens K6BP](#) who I think is better equipped than most to appreciate the potential of LinHT. K6BP tried to create a similar unit a decade ago. That project was ultimately doomed by some of the technology choices that were made, and the “not quite up to the requirements” technology available at that time. Thus K6BP can offer knowledgeable commentary on the technology choices of the LinHT to argue for the potential of the LinHT project.

Disclaimer - I don't agree with most of K6BP's theme in that post.

... an amazing hardware project called LinHT, which you can see [here](#). What is LinHT? It's a handheld transceiver with a 500 KHz I/Q modulated SDR based on Semtech SX1255 RF-to-digital transceiver IC, capable of all modes and as much as 2 megabit per-second communications, and including a Linux system-on-module. Because production of good HT cases isn't something we have down yet, it fits in a Retevis C62 case. [We could use a good project with industrial designers who just make HT cases, visually desirable ones, and injection molded, please, not jaggy 3D prints.] Developers can use GNU Radio flowgraphs or C/C++ on the built-in development platform in the HT! Prototypes work today and an alpha production run is being sponsored by PCBWay. If you want to start working on the platform before boards are available, the [SXceiver](#) is a good way to learn SX1255 and develop for it. There is a SoapySDR driver for it, so you can get it running with existing SDR software, or GNU Radio, immediately.

LinHT is the most important hardware project in Amateur Radio today. Among other things, it is the perfect platform to run a variant of [RADE](#) on VHF/UHF. RADE may just be the future of voice, all voice, on Amateur Radio. It integrates what we used to use a CODEC and MODEM for into one unified component powered by machine learning (the non-hype version of AI). In tests, it works at a significantly lower signal-to-noise ratio than analog voice modes, even SSB, and legacy digital modes like D*STAR and DMR, while providing better fidelity, noise immunity, and fade resistance.

Even if RADE isn't the next big thing, LinHT should get us there, because it provides a hardware platform capable of running new, experimental, and modified modes, and isn't limited to just FM and FSK. Your smartphone uses complex multi-carrier modulation, HF digital modes use it, your HT should too.

...

LinHT uses a pre-made single-board-computer with an ARM CPU containing two ARM A55 processors, a Mali GPU, and an Ethos-U65 microNPU to accelerate machine-learning applications, all combined on to a “stamp” form module, which is soldered onto the main PCB, and costs as little as \$32 in quantity. Thus, very little of LinHT effort is invested in the computer side of the design, and the design can easily change as better single-board modules become available.

Technology choices that point to the likely ultimate success of LinHT:

- There is a rich ecosystem of SDR innovation waiting to be put to use by porting it to a suitable device, such as a (portable) LinHT.
- Confining the design of the LinHT to a single printed circuit board (PCB) that can be manufactured by contract manufacturers.
- The compute capability can scale and be easily upgraded as technology improves and more compute-intensive applications emerge.
- Software can improve by using “straight” GNU Radio flowgraphs. Just code in GNU Radio, drop it into a LinHT, and test out the unit.
- Inexpensive design - instead of trying to create an entire VHF / UHF radio from the ground up, especially a problematic (battery, form factor, user interface, manufacturability, etc.) *portable VHF / UHF radio*, the LinHT team adopted a brilliant “symbiot” strategy. They chose a popular, inexpensive portable radio - the [RETEVIS C62](#), and will “transplant” a LinHT printed circuit board into a C62. All the “hard parts” of a portable radio design are already done by RETEVIS - case, power supply, user interface (screen, keyboard), etc.
- Early adopters and developers can “easily” create their own “LinHT C62”. Transplanting a new PCB into a portable radio is a reasonable task for techies, or just wait for someone to be willing to do this in batches for a small “commercial modification” premium.
- As an open source design with no patent or other Intellectual Property issues, this “stick a new LinHT PCB” into an existing portable radio design can be easily, inexpensively, and rapidly adopted by nearly any portable radio manufacturer.
- As for the certification issues, portable radio manufacturers can simplify a standard software load to make the “as sold” unit an innocuous, easy to certify “just FM” radio. But this being a *Software Defined* Radio, the user can purchase it and immediately load the latest and sexiest LinHT software, or their own new radio technology developed in GNU Radio, and begin using it.

But the ultimate potential of LinHT *isn't just in the portable radio form factor* (though that will likely be the most widely used, most popular form factor because it will be the least expensive).

The ultimate potential of LinHT is that it will enable Software Defined Radio operating at VHF / UHF *to be developed and used at scale, inexpensively*. A vendor that sees the rapid adoption of LinHT portable radios will quickly see the sales potential of a LinHT-based mobile radio (that's sold for 5-10x the cost / profit of a portable radio). Especially if they are the “first mover” for such a unit.

The potential of LinHT *is so disruptive* that it's being ignored by many “big players” in Amateur Radio innovation... in my opinion because it's “not invented here” or “oh, that's *M17 stuff* and we ignore that”.

I won't “shame names” here, but you can readily see the implications of LinHT compared to:

- An open source high quality digital voice system (that's based on a Software Defined Transceiver used for training Electrical Engineering students),
- A "fixed function" unit for multiple Digital Voice modes used in Amateur Radio, and
- A major Amateur Radio manufacturer that will soon release a mobile radio with the primary features being a legacy Amateur Radio data mode, and a legacy Amateur Radio digital voice mode.

In a few years, products based on LinHT technology will blow past all of that.

Seriously folks... I think that LinHT is going to be a Blackberry versus iPhone moment. I'm confident that we will see LinHT technology available by the end of 2025, and candidly... *damn, I can't wait to see that happen!*

If I were a manufacturer that wanted to really grasp this trend and not get left behind in the technological dust like what happened to Blackberry, I'd quickly book a ticket to Poland to be able to attend [M17 Conference 2025](#) on 2025-09-06 and 07 for *this* presentation:

LinHT – a GNU Radio configurable handheld transceiver – Wojciech Kaczmarski (SP5WWP), M17 Foundation

[and many others.](#)

As always, comments appreciated - just click below.

And of course, I look forward to discussing the implications of LinHT, as I see them, and many other subjects at Zero Retries Digital Conference 2025 in just four weeks.

Leave a comment

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A Modest Proposal

An email exchange between Jim Shepherd W6US and Steve Stroh N8GNJ

W6US leads off:

It seems that M17, MMDVM, LoRa, Meshtastic, and a bunch of other new voice and data modes are trying to fit into crowded VHF and UHF bands. Why not do this development and usage in the Microwave bands above 1GHz? The quick answer is the lack of radios on these bands...

30 years ago, you virtually needed a degree in Microwave Engineering in order to build an all mode radio for these bands that was portable without a forklift... Now there are 10 GHz+ radios with self contained batteries and patch radios like the Ruby ones. By moving all these other modes up and developing the necessary hardware, activity on these bands will be definitely increased. These are the bands we are more at risk of losing.

Also, the available bandwidth on these higher frequencies allows for faster symbol speeds. The lowest of these bands, 23cm, is bigger than all our ham allocations put together below 30 meters!

I replied (lightly edited for publication):

With respect... in my opinion, your first sentence contains a major logic flaw - "crowded VHF / UHF bands".

I don't think they are.

The only thing that's "crowded" is Amateur Radio's flawed (well, outdated, by more than 50 years) choice of channelizing and exclusively allocating a channel for a particular use and a particular system in a geographic area... forever.

We only got to that point because Amateur Radio adopted the surplus equipment (and thus the paradigm) of Land Mobile Radio operations circa 1970 or so. And that industry rapidly moved on to more spectrally efficient trunking systems, which eventually led to cellular mobile radio. But Amateur Radio has been stuck in the Land Mobile Radio repeater paradigm circa 1970.

There's ample "room" in VHF / UHF for new modes if you look at the situation objectively. Look at the VHF / UHF bands in your area with a wide bandwidth receiver like a VHF / UHF Software Defined Receiver set to the full band, like 144-148 MHz or 222-225 MHz and you'll see a lot of... *no activity*. Thus all those frequencies, in that moment, in your area... aren't being used. And thus, that combination of unused frequency, unused time slot, in a given area is available for use.

I've cited an FCC letter from decades ago now - see <https://www.n8gnj.org/2021/03/repeater-coordination-does-not-exclude.html> that states that *at most*, a repeater "coordination" only establishes priority of use, *not exclusive access to a frequency in a given area*.

And we have to keep in mind that there are two vastly different scenarios - highly urban areas like NYC or Los Angeles, where there probably is a lot of use for some frequencies and thus little "room" for alternative systems.

But most of the US is like Rugby, North Dakota, the geographic center of North America, where Amateur Radio VHF / UHF spectrum doesn't have nearly as much use.

In fact... the "danger" of Amateur Radio VHF / UHF spectrum isn't that it's too intensively used... it's the opposite - *it's too little used*, as evidenced by the "no activity" issue.

There's also the "quiet repeater" syndrome that nearly everyone has acknowledged. What is the point of having a repeater on the air... that doesn't get used?

I've offered a thought experiment called SuperPeater, where such quiet repeaters get repurposed for servicing multiple types of radio systems. Just like a MMDVM can accept multiple types of Digital Voice, a SuperPeater could accept far more types of use, including data, Meshtastic, M17, etc. A

SuperPeater can have multiple input frequencies, and it transmits a high bandwidth data stream that is easily received by just about any Software Defined Receiver and a dedicated Raspberry Pi. Only want to listen to voice transmissions from the SuperPeater (using any mode)? Check just the voice mode boxes on your SuperPeater receiver.

As for 1240-1300, we're about to lose the use of most of that band because the "landlords" - Global Navigation Satellite Systems (other than US GPS) are now becoming more numerous and don't want potential interference from Amateur Radio usage. We'll be left with some slivers of remaining spectrum in that band, but not much. It's no longer "largely unused". Otherwise that's a great band, and the Icom IC-905 and IC-9700 both cover it, but only up to 10 watts (IC-9700). And Icom does have a fast data mode that can operate there - Digital Data mode @ 128 kbps.

Up beyond 1240-1300, we get into raw physics. Everything above 1 GHz is attenuated by terrestrial clutter - trees, terrain, buildings, etc. Thus we have to resort to high central nodes on tall buildings, towers, and mountains. That used to be "easy and cheap" because those who operated communications infrastructure on those high points were often Amateur Radio Operators or at least sympathetic to Amateur Radio operations. Not so much now. You can still get on those sites, but only by paying commercial rates and using commercial equipment (expensive isolators, new repeaters, commercial antennas installed professionally), etc.

One of the best ways we can "save" our bands above 1 GHz is to use them for satellite operations, especially an Amateur Radio Geostationary payload near North America. Amateur Radio Operators in the Eastern Hemisphere have QO-100 which uses an uplink on 2.4 GHz and downlink on 10 GHz. And there are Amateur Radio microwave network links that are operating on Amateur Radio exclusive portions of 10 GHz.

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Thought Experiment - The Amateur Radio Future Systems Skunkworks

By Steve Stroh N8GNJ

As I mentioned in **Zero Retries 0210**:

Future / Future Systems Organization

I credit Zero Retries Pseudostaffer Steve Lampereur KB9MWR with this idea from a brief mention in a blog post - [Meshtastic](#):

I have written the ARRL about the concept of bringing back the future systems committee...

Yes, the ARRL once had a committee that actively thought about not just the future of Amateur Radio in general, but Amateur Radio systems of the future. You can't always get "predictions" *right*... but that doesn't mean you shouldn't *try*.

Amateur Radio needs a Future / Future Systems Organization, but not confined to a single organization such as the ARRL, or a single country.

And as such things happen in my mind, that combined with some ideas from a [recent post](#) by Bruce Perens K6BP:

Disclaimer - *I don't agree with most of K6BP's theme in that post.*

And finally, I think ARDC fails by exclusively funding projects, not people. This limits how much "R" they can really have in "R&D", as you have to go into your grant application with a complete plan of what you are going to build. But real researchers start by exploring ideas, and don't necessarily know what will come out of them. So, the act of creating something really brand new can't be funded by ARDC within its own guidelines, and the "R&D" they do fund will really just be development, to build out something already known. I've discussed this, and the alternative, in more detail [here](#).

I completely understand why ARDC operates and allocates their grants the way they do. In transparency, I think that whatever its flaws, ARDC is enabling a new era for Amateur Radio with their grants, especially Research and Development grants, to projects that are in that limbo area between those that can reasonably be attempted by "individual + close collaborators", but fall short of being lucrative enough to justify commercial development.

The US Internal Revenue Service (IRS) is a fearsome beast if a person or organization or company runs afoul of its arcane regulations (or the IRS *suspects* that has happened). Thus providing grant funds only to entities that are organized as formal not-for-profit organizations (or the functional equivalent outside of the US) is an unfortunate side effect.

But I don't think that requirement completely excludes K6BP's observation that sometimes, it's more appropriate to fund "people" instead of "projects" or organizations.

I think that a solution to this issue would be something like an...

Amateur Radio Future Systems Skunkworks (ARFSS)

At this moment, such an entity is entirely in my imagination.

Most expediently, ARFSS would be based in the US so the not-for-profit structure that ARDC requires is fully aligned. There are also some good reasons for ARFSS to not be based in the US, such as Canada or Europe. US vs non-US is worth further discussion, but I've been told that European (and especially Germany's) not-for-profit regulations are even more strict than US regulations. This is a point worth extensive discussion if this moves forward into a viable idea.

And, to another issue that K6BP raised in his article, ARFSS, if based in the US, would have to be careful that if ARDC grants were accepted, such grants wouldn't exceed 49% of the total income of the organization.

ARFSS would be focused on speculative ideas that require some "seed capital" to prove out that an idea is viable. ARFSS would be a fiscal sponsor to individuals that have "interesting ideas", kind of a [MacArthur Fellows](#) for pursuing ideas for technological innovation in Amateur Radio. The difference between ARFSS and a typical ARDC grant would be that ARFSS funds the *person*, not necessarily a specific project. If a specific project is already identified, ARFSS could also act as a fiscal sponsor if the project isn't already organized as a not-for-profit and thus cannot accept an ARDC (or other

organization) grant directly.

One significant difference between ARDC and ARFSS would be that ARFSS would solicit guidance from a broad base of individuals with domain knowledge, such as those who have deep experience with Packet Radio Networking. This is similar how the M17 Foundation has created its Advisory Committee.

That is one weakness of ARDC; it does not (formally) seek out a broad base of opinions beyond its Board of Directors (7 individuals) and its volunteer committees (36 individuals, silo'd into specific areas of work).

The other significant difference between ARDC and ARFSS would be that ARFSS *identifies and seeks out* specific projects that are identified as “needed technologies” within Amateur Radio and solicits ideas on how to create such “needed technologies” at scale. A few examples:

- An open source design for a power amplifier that can be driven to full power (10 watts minimum, 25 watts ideal) with the very low output power of a Software Defined Transceiver (typically, 100 mW or less). Such amplifiers exist, but they’re expensive. (Inexpensive such amplifiers sourced from China - AliExpress, etc. have proven to be hit-or-miss, even ordering more than one of the same item.) In the short term, we don’t seem likely to get a true Software Defined VHF / UHF transceiver capable of reasonable power on VHF / UHF, but such an amplifier combined with a (low transmit power) Software Defined transceiver such as the LinHT would be the next best thing.
- A Frequency Hopping Spread Spectrum Radio for use on 144-148 MHz, 222-225 MHz, or 420-450 MHz with a dwell time under 100 ms (unnoticeable for typical voice usage on those bands).
- A simple, inexpensive data-only [Remote Radio Unit](#) (RRU) designed for individual users, powered by 12 volts over Ethernet. The idea would be that you can put it up on a pole near the antenna and mitigate the signal loss issues of a long run of coaxial cable. (The M17 Foundation RRU is more capable than this description, and thus more expensive.)

Perhaps K6BP’s [Post Open](#) will be such a vehicle, and individuals, groups, or corporations can channel contributions to “Post Open Amateur Radio Skunkworks”.

Please let me know what you think about this thought experiment.

Leave a comment

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Thought Experiment About Mesh Networking

By Steve Stroh N8GNJ

*Dynamic Radio Mesh Networks... **that work**... with reasonable reliability and reasonable throughput... have been one of the “unobtainiums” of the computer and networking industries since... well, forever. That includes Amateur Radio. But Amateur Radio may now have a “magic bullet” available to enable Dynamic Radio Mesh Networks to function well and scale - **ka9q-radio**.*

Amateur Radio nearly did it right... arguably, we *did* do it right, for a while in building wide area Amateur Radio data networks, especially in a few places and specific networks. Amateur Radio created a lot of different radio network topologies - Texnet, ROSE, Net/ROM, FlexNet, bit regenerative data repeaters, 56k bps repeaters, and many others. But all of those topologies had various flaws, mostly because of the technology limitations of the Packet Radio era. Such flaws include microprocessors were slow, PCs were expensive, RAM was precious, radios for fast data rates were really expensive, etc.

Unfortunately, by the time we had cheaper, better technology to tackle those issues, most of Amateur Radio had moved on from doing data communications over Amateur Radio, in favor of doing almost everything via the Internet such as Amateur Radio Over Internet (repeater linking and radio hotspots), APRS using the Internet as a backbone, etc.)

Hard Lessons Learned - What Not To Do

I posit that one of the biggest successes in Amateur Radio networking, from our hands-on experience in building wide-area (regional) radio-based data networks, was that we learned *many things not to do* when building Amateur Radio wide area data networks. Here are a few examples, from my experiences:

- Don’t use the same frequency for both local user access and networking. That only works in a very lightly loaded network.
- Digipeaters (time shifting of receive the packet, buffer the packet, and retransmit the packet, on the same frequency) are a better network than no network at all... but digipeater networks don’t scale (well). The only way that the APRS digipeater network with every digipeater operating on 144.39 MHz is that the packets are very small and if they’re lost, it’s of little consequence.
- One of the hardest concepts in radio networking to understand is the [Hidden Node Problem](#). That’s the primary reason I believe so strongly in using full duplex repeaters for data communications, which results in a low number of Hidden Node collisions and thus overall higher throughput.
- While dynamic network topography *can* be a good thing, the network topography being *too dynamic* is generally a poor experience. Dynamically adding a newly discovered node is better than a network that requires manually adding new nodes, which may happen at some other nodes, and not at all on others. But nodes (that seem solid) can quickly disappear because the “path” was actually brief (or regular) “ducting” from a temperature inversion. There’s also the issue of much of the available bandwidth being consumed by “network updates”².
- Having adequate compute resources in each node *matters* in a network so that each node can make good choices on routing. Example - keeping track of historic trends (that temperature inversion node comes and goes at predictable times, so best not to use it), having enough RAM / buffer to not drop packets in progress through the network even when busy, being able to accumulate statistics, error logs, etc.
- It’s critical to use *good* metrics for choice of path versus easy metrics. Example - figuring out how to measure / record / share Signal to Noise Ratio (SNR) rather than raw signal strength, number of retries necessary to get a packet delivered (fewer is better), being able to tell when a node is approaching saturation (thus better to choose another route that’s not saturated), etc.

In writing this, it strikes me that most of this information is “tribal knowledge” (and thus, perhaps soon to be lost) from that era. I don’t recall reading a solid “Lessons Learned, What Not to Do In Building Amateur Radio Data Networks” paper, presentation, article, etc. that encapsulates all of this information.

The closest to such a “paper” that I can think of is the explanation for the chosen network topography of TARP networks (only point-to-point links on dedicated frequencies), explained by Tadd Torborg KA2DEW in [Networking On Purpose](#). Another good exploration about issues in scaling with radio based data networks that are relevant to Amateur Radio is [Decentralized Channel Management in Scalable Multihop Spread-Spectrum Packet Radio Networks](#) by Timothy Shepard KD1KY.

If someone hasn’t already tackled this subject (that I haven’t yet found), this subject would be a great paper for someone to do for ZRDC 2026!

Meshtastic Is Rediscovering Lessons (Already Learned) of Amateur Radio Data Networking

Thus those of us who have some of this “tribal knowledge” from building Amateur Radio data networks are sympathetic to the pains being experienced in the rapid growth and scaling of [Meshtastic](#) networks based on LoRa technology.

Part of the problem is that Meshtastic, being developed *in the 2020s* is separated by a generation or two from the growth of wide area packet radio networks *in the 1980s*. Although much was written about Amateur Radio data networking, as K6KJN documents in this issue’s DLARC column, there’s still a *lot* of Amateur Radio material that has never been digitized and made available online.

This discussion thread - <https://partyon.xyz/@nullagent/113861754522594610> is an interesting exploration of some of the issues that Meshtastic is experiencing as Meshtastic networks attempt to scale up. One example is the reduction in throughput that results from doing user access *and* networking on a single node on a single frequency (digipeating).

In the discussion thread, there’s also a mention of the potential to implement LoRaWAN³ relay / gateways in the Meshtastic network architecture. LoRaWAN nodes are able to aggregate multiple LoRa channels for greater throughput and fewer collisions on congested channels.

Commercial implementations of radio-based mesh networking weren’t great, except in very limited circumstances, like mesh networking inside the home where 2.4 and 5 GHz are used for end user devices, and the new 6 GHz band is used for inter-node networking.

Mesh network seems to be well-implemented in modern military radio systems. Most (US) military radio systems that I’ve seen discussed have mesh networking as a standard feature - between vehicles, between individual soldier radios, shared access to the backbone (satellite), etc. and (again, from what I’ve read) seems to operate seamlessly.

Common Point of Failure with Most Radio-based Mesh Networking

The main problem I’ve seen that’s common to all the failed mesh networking systems (including Amateur Radio) is that “frequencies and nodes get crowded”. Amateur Radios can only be set to one frequency at a time, such as 144.39 MHz for APRS digipeaters. Thus that’s where all nodes transmit... because if you transmit, you want to be heard by the rest of the network... *right*?

But what if we could “spread out” our transmissions, over a band such as 2 meters (144 - 148 MHz)? As an example, KK7ABC finds that 145.51 MHz is quiet in her area, and thus sets her Meshtacular⁴ node to 145.51 MHz. But then there is the issue of communicating with other Meshtacular users who don’t know that KK7ABC is now operating on 145.51 MHz (and her use of 145.51 MHz has not been coordinated in advance)⁵.

Answer - without previous coordination, no other Meshtacular user will know that KK7ABC is operating on 145.51 MHz.

But now we have a new paradigm that most Amateur Radio Operators just are not aware of that completely changes the old paradigm that requires radio-based mesh networks to operate on the same frequency, or use multiple frequencies only with previous coordination - [ka9q-radio](#).

ka9q-radio - “Receive It All”

In the explanation below, I’ll continue to use 2 meters - 144-148 MHz as an example. That frequency range is easily within the capabilities of nearly any Software Defined Receiver.

The [Using KA9Q-Radio](#) page from Northern Utah SDR explains this capability well, in a sentence:

The “ka9q-radio” is a *different* sort of SDR program suite, its strongest point being that it can *simultaneously* receive a large number of frequencies from a single piece of SDR hardware with modest computing hardware - no GPU required!

My mental model for ka9q-radio used for the application of a dynamic mesh network is that the ka9q-radio software, with minimal hardware:

- Software Defined Receiver that can tune 144-148 MHz and has a minimum bandwidth of 4 MHz,
- The Software Defined Receiver has an I/O interface capable of the required bandwidth, typically USB-3 or equivalent,
- A computer with “sufficient” compute power and RAM, to run the ka9q-radio software. KA9Q has stated that a Raspberry Pi 4 is sufficient, and now we have the [Raspberry Pi 5 with up to 16 GB of RAM, for only \\$120](#).

Then the ka9q-radio software creates a set of virtual receivers, all operating simultaneously.

Each virtual receiver in a ka9q-radio system is entirely software defined. Thus, if KK7ABC and her co-conspirators for technological experimentation want to try to develop a better mesh network by spreading out through the entire 4 MHz of the 2 meter band, they (and the co-conspirators) set their ka9q-radios to receive on each 20 kHz of 2 meters:

- 144.00 - 144.02 MHz
- 144.02 - 144.04 MHz

- 144.04 - 144.06 MHz
- ...
- 145.50 - 144.52 MHz
- 145.52 - 145.54 MHz
- 145.54 - 145.56 MHz
- etc.

Thus, when KK7ABC chooses to transmit on 145.51, any of her co-conspirators within simplex range of her station *will* receive her transmissions because (thanks to ka9q-radio) they'll already be receiving there. And they won't miss any of my transmission because unlike a conventional receiver that's scanning, ka9q-radio doesn't "lock up" on a transmission, and doesn't switch from one frequency to another - *it's receiving all of the (defined) channels simultaneously*.

I'm not an expert (or even a beginner) on ka9q-radio, and I don't know the specifics of how ka9q-radio can be applied to mesh networking. But it seems very clear to me that ka9q-radio's *receive every channel, simultaneously* capability nicely solves the primary bottleneck of mesh networking in being able to "distribute the load" of a mesh network over a lot more spectrum, rather than a few easily congested channels and nodes.

This scenario of widespread use of ka9q-radio also nicely solves a problem of the use of low power / disadvantaged antenna situations that I've described a few times here in Zero Retries. The default radio of a newly licensed Amateur Radio Operator is typically a low-cost, low power portable radio using only the low performance "rubber duck" antenna that's included with the radio⁶. They don't know that such a combination just won't be heard very well when used indoors, trying to access a repeater, or operating simplex (except in very local situations like within one mile). Thus if a network were to have a lot of stations that were able to simultaneously monitor all the channels on 144-148... such a station would be a lot more likely to be heard (by another station that's within simplex range).

If you're interested in setting up your own ka9q-radio system, the [ka9q-radio Resources](#) page is an excellent, reasonably up-to-date reference on how to do so, including links to a number of talks given by ka9q-radio creator Phil Karn KA9Q.

KA9Q Comments

I reached out to KA9Q to clarify some points, and he responded with this additional information:

Yes, it's the efficient multichannel nature of ka9q-radio that makes it stand out. It lacks a big flashy GUI, but there are plenty already, and manual control doesn't really make sense for a receiver with hundreds of channels. (Individual channels can be used interactively, and the [ka9q-web](#) guys are making very good progress turning it into a spectrum analyzer/receiver).

As I said at Dayton, "build it and they will come". Here are some of the existing uses, all multi band and multi frequency:

1. Precise HamSci observations (with external frequency references)
2. FT8/FT4/WSPR monitoring and reporting (related to #1)
3. HFDL decoding and reporting
4. FM repeater monitoring/archiving (including classic packet radio and APRS)

Potential uses, all waiting for appropriate open-source decoders or software front ends to be ported to Linux:

1. Back end for a high capacity web SDR similar to KiwiSDR or OpenWebSDR
2. Multi-input FM repeater, e.g. for ISS (prototyped and working)
3. Digital voice monitoring/archiving: DMR, D-star, P25, FreeDV, Fusion. (awaiting integration with MMDVM)

All on a large scale (hundreds of channels) with minimal hardware. Antennas would seem to be the only real limitation. How many antennas perform really well from LF through 6m?

At my station one 8-core Intel i5-8260U NUC, now some years old, handles a Rx888 (at 126 MHz real sampling rate) on HF and 6m and a Rigexpert Fobos (at various complex sample rates). Decodes and reports all known FT8, FT4 and HFDL channels across HF and 6m. (WSPR is currently decoded by a different system, but I'll merge it soon). 66% idle CPU.

I recently moved my ka9q-radio repeater monitoring instances from 3 RPis to a new NUC computer, a Beelink Ryzen 7 6800. The Pi 4s worked, but were increasingly cumbersome to power, cool and manage in large numbers, and they generate a lot of RF noise.

The new Ryzen now handles three Airspy R2s and a new HydraSDR One, all at 20 Ms/s real sample rate. It is now monitoring all the local 2m/125cm/70cm FM repeater channels, though I don't really have the Hydra doing much yet. (Actual recording is done by another system with a lot of disks). CPU is still 87% idle!

Limiting factor on all computers is not the processing, it's the number of USB controllers. Each Airspy or Hydra produces a steady stream 240 Mb/s so each needs its own USB2 controller, and the older NUC only has 2x USB2 + 2 Super Speed (USB3). The Ryzen has 4x USB2 and 4x USB Super Speed (USB3), so it can handle the four Airspy/Hydras. It could probably handle the Rx888 with USB3, but I like margin. Larger computers with additional USB3 bus controllers plugged into PCIe slots could handle considerably more.

...

Yes, ka9q-radio should be a very good tool for [the ideas in this article]. At the time AI, WB0MPQ and I built a proof of concept at a tower site in NJ that he had access to. I used several cheap Radio Shack scanners to receive multiple packet channels other than the one we were

transmitting on. Because it required per-channel hardware, which was necessarily cheap and not very good (the scanners heard each others' IFs!) it didn't perform that well, but it did demonstrate the idea.

Certainly the time is right to try it again with ka9q-radio, and I appreciate you making the connection. A single Airspy R2 or HydraSDR One can receive an entire band (10m, 6m, 2m, 125cm or parts of 70cm and 23cm) and nothing really limits you to one band; I just retired my RPi's and moved the Airspys to a single NUC, which can handle them all.

I wrote a AFSK packet receiver a while ago just to get APRS but I'd be embarrassed to use it for any serious packet radio project today; we urgently need a modern medium speed digital modulation for VHF/UHF, and it's been on my back burner for years. I know people are playing with LORA, and I don't really oppose that, but it's proprietary and we could probably do something better ourselves.

Let's keep thinking about this.

A few clarifications:

- ka9q-*web* is a secondary project by others to provide a more comfortable-for-casual use Graphical User Interface (GUI), largely by reusing code from other Software Defined Receiver GUIs adapted to ka9q-radio.
- KA9Q and others have written a number of ka9q-radio “decoders” for, example, FM, 1200 bps Audio Frequency Shift Keying (AFSK) Packet Radio, Automatic Packet Reporting System (APRS), and others. For each new mode, there needs to be a specific decoder written (or, perhaps, eventually a Machine Learning (ML) subsystem to recognize and select the appropriate decoder.
- The Beelink Ryzen 7 6800 that KA9Q is now using, at a quick glance on Amazon, is a small unit barely bigger than a Raspberry Pi when enclosed in a case, priced around \$340. That it is so capable compared to multiple Raspberry Pi 4s (or now, Raspberry Pi 5s) is interesting.

For Further Research on Reducing Channel / Network Contention

At the risk of “forking” this discussion / idea into too many divergent directions, I'll offer these additional “food for thought” references for those that wish to dive deeper “down the rabbit hole”.

- My “other thought experiment”, SuperPeater, is somewhat relevant to this discussion:
Zero Retries 0179 - Explaining the Use Case for Data Over Repeater - Part 1
Zero Retries 0181 - Explaining the Use Case for Data Over Repeater - Part 2
Zero Retries 0182 - Explaining the Use Case for Data Over Repeater - Part 3 (SuperPeater Introduction)
Zero Retries 0189 - Explaining the Use Case for Data Over Repeater - Part 4 (SuperPeater, Continued)
- [A High Performance, Collision-Free Packet Radio Network](#)
This paper by KA9Q was presented at the 1987 Computer Networking Conference (predecessor of the Digital Communications Conferences):

For the past several years, those discussing “level 3 networking” have made much of the performance gains to be had through hop-by-hop acknowledgements. In this paper I will show that, while sometimes helpful, hop-by-hop ACKing is not the panacea it is generally perceived to be. Only fundamental changes in the way we allocate and use frequencies will really fix the problem.

It's so interesting that the problem that KA9Q identifies in 1987, is quite possibly solved with his creation of ka9q-radio four decades later.

- [The Puget Sound Amateur Radio TCP/IP Network \(Circa 1995\)](#)
The Puget Sound Amateur Radio TCP/IP Network (also known as WETNET, the Washington Experimenter's Tcp/ip NETwork), centered in the Seattle, Washington metropolitan area, has built an extremely functional packet radio network based on TCP/IP networking and cellular RF techniques. The network encompasses more than eighteen separate Local Area Networks, an estimated 200 users, four 9600 baud bit regenerative repeaters, and a full time Internet gateway. This paper is intended to provide an overview of an operational Amateur Radio TCP/IP network. The primary relevant point about this network is that it used realtime, full duplex repeaters to solve the Hidden Node Problem. There were very few collisions because all users of the repeater knew, within milliseconds, when the repeater(s) were already in use, and when they were not and thus available to handle a transmission.
- [PACSAT](#)
(Link is to a search for “PACSAT” in the Digital Library of Amateur Radio & Communications, the best aggregation of PACSAT (Packet Radio Satellite) information ever assembled in one place, freely available.)
PACSAT was a prescient solution to the issue of channel contention. A PACSAT had a single transmitter operating at a high data rate (9600 bps) on the 70 cm band (430-440) with *four* receivers on different frequencies operating at a lower data rate (1200 bps) on the 2 meter (144-148 MHz) band. Not only could a PACSAT operate as a flying store and forward mailbox, but in between “user traffic” it could transmit bulletins. PACSATs worked... it was just a bit ahead of their time, and now the concept is [being resurrected](#):

AMSAT's Fox-Plus-B satellite is also expected to fly AMSAT's PACSAT payload.

In Conclusion...

I understand that the potential of using ka9q-radio as a routine part of an Amateur Radio station / dynamic mesh network, is a bit hard to grasp at first... but really no less so than were microprocessors... and Linux as an *embedded* operating system... and Software Defined Radio, and before those “disruptive technologies”, Frequency Modulation (FM), repeaters, Packet Radio, etc.

Now we have ka9q-radio as a capability that takes Software Defined Receivers well beyond the paradigm of “receive one frequency / channel, at a time” (yes, with the improvement of a bandscope so we can “survey” an entire band). At least for receiving (which is where such an improvement is most needed, in my opinion), ka9q-radio frees us from the constraint of our synthesized radios being a minor improvement crystal controlled radios... minus the crystals.

My thanks to Don Rotolo N2IRZ, Brian Webster N2KGC, Kay Savetz K6KJN, and Phil Karn KA9Q for their help with this article.

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

AMSAT-CA Quietly Comes to Life



Image courtesy of AMSAT-CA

With no overt publicity at all (that hit my RADAR, only noticed when I checked in on their website), [AMSAT-CA](#) has come to life. It now has a Mission Statement:

AMSAT-CA promotes, develops, and supports amateur radio in space, including via man-made and natural satellites (e.g., the Moon), space stations and planets, and related experiments, as well as new developments in technology, methods and techniques.

... and a leadership team of seven persons, and recognition from AMSAT-US and Radio Amateurs of Canada. There have been several articles posted in the [Updates](#) section of the website (but, sadly, no RSS feed for easy following).

Very cool development especially for the potential of an Amateur Radio payload at GEO, sponsored partially by European Space Agency (of which Canada is a member) to provide coverage of at least part of North America.

Brief Report from AREDN Team at DEFCON 2025

From Zero Retries Pseudostaffer and AREDN Ambassador Orv Beach W6BI:

I pulled in from Vegas about two hours ago. I'm pooped! I'm told that the Ham Radio Village at DEFCON was one of their best ever. We had a ton of traffic past the AREDN booth. Very positive and we plan on returning next year.

The 802.11ah devices (HaLow) have only been in the AREDN nightly builds for about 6 weeks, and people are still evaluating them. One of my HRV AREDN booth dudes, Don KE6BXT brought along a couple of freshly-purchased Heltec HD01 transceivers. After a bit of fumbling around, we got the AREDN code installed on them. I did a throughput test using the built-in iperf utility and got close to 2 Mbps.

We had been running a video feed across the room on 5.8 GHz, but yesterday we pulled that link down and substituted the 900 MHz nodes. I cranked the video feed down to 15 fps, and even with the 900 MHz set to only 1 MHz, we got rocket steady video across the link. Very impressive!

Maybe... 2026... will be my year to begin attending DEFCON. I really need to mingle at a venue full of NewTechHams like DEFCON.

CQ Digital Connection Columnist Don Rotolo N2IRZ "Returns" to "Print"

Near the end of its life, I subscribed to CQ Magazine for year, solely to be able to read the bimonthly Digital Connection column written by my friend and Zero Retries Pseudostaffer (and Zero Retries Founding Member 0003) Don Rotolo N2IRZ. I consistently learned new things from N2IRZ.

When CQ died, N2IRZ decided to treat that as his retirement from regular writing, other than his occasional contributions here in Zero Retries, including his very last "CQ" column - Print and the Digital World. Thus I mourned the passing of N2IRZ's bimonthly doses of Amateur Radio Digital Wisdom (whatever he chose to share, column by column).

Given that N2IRZ had a 25 year history of writing for CQ and CQ-VHF, I would (admittedly, selfishly) "encourage" (nag) him periodically to upload his columns to DLARC for posterity - and my reading pleasure. Normally the response is "yeah, yeah, *busy, busy, busy*, but it is on my list".

But most recent ping to N2IRZ *got a different response!*

Ha! Search DLARC for N2IRZ.

I'm taking the columns and formatting them in a way similar to how CQ might've displayed them.

It takes me about half an hour to format one column so I've been doing a couple every few weeks, I don't really have a ton of time to do stuff like that.

Slowly, but surely, I'm working on it, and I hope to finish within a year or two.

Now there's a formal collection in DLARC:

[Don Rotolo N2IRZ articles](#)

Amateur Radio articles by Don Rotolo N2IRZ, provided to DLARC by the author.

Here's the most recent N2IRZ column to date in DLARC - [Internet Archive, and Other Bits](#). Love it!

Of course, this is a reminder to me that I need to do the same thing - posterity-ize Zero Retries for long term archival in DLARC within the next year while DLARC has funding to be actively tended. (Substack packages each issue with incredible amounts of unnecessary HTML.)

And... N2IRZ's collection is yet another wonderful example of the incredible gift that **Digital Library of Amateur Radio & Communications** is to the worldwide Amateur Radio Community, and posterity, and human technological history. Thank you to Internet Archive, to ARDC for the grant funding for DLARC, and especially for the very hard work and diligence of Kay Savetz K6KJN.

New Features Being Put in CS7000 M17 GPS and CS7000 M17 PLUS Radios

Email from Connect Systems:

The features being put in the radios are as follows:

1. **GPS Roaming.** This will allow you to generate a code plug based on a database in the radio and your GPS location. Code partially written.
2. **GPS Location.** This will allow you to determine where you are and also find your way back if you get lost. Finished.
3. **Enhanced Edit.** This will allow you to modify a channel or create a new channel. Everything is on a single screen. Working but not finished.
4. **Enhanced Monitor.** This will allow you to monitor a conversation and by a press of a single key, the radio will analyze the channel and allow you to speak back to them. Working but not finished.
5. **Enhanced Scanning.** Will allow you to automatically make a code plug based on the activity within your area.
6. **Spectrum Analyzer.** Will graphically show the amplitude of the RF signal verses the frequency. Code written but not tested.
7. **Channel Analyzer.** Will allow you to monitor a single channel and store all the different CTCSS Tones, DCS Codes, Group Calls and Private Calls that is being used.

Impressive that Connect Systems continues to expand the capabilities of these radios. Thanks Jerry!

[Candidate for US Congress Focuses on Issues Related to Amateur Radio](#)

From Amateur Radio Daily - 2025-08-10:

Austin Ayers (WX3SVR) is [running for US Congress](#) with a campaign focusing on the rights of the amateur radio community. In an email sent to *Amateur Radio Daily*, WX3SVR described three bills he'd plan to introduce if he's elected:

1. Amateur Radio Accessibility and Antenna Rights Act

If elected, I would introduce legislation to prevent HOA's, condominium boards, and other private entities from enforcing any such rules that could ban antennas from being installed. I would also prevent such boards and agencies from throwing requests for antennas into a bottomless pit, and guideline the maximum of 30 days to issue approval.

2. Amateur Radio Spectrum Protection and Expansion Act

If elected, I would introduce and sponsor a bill that would protect and expand the amateur radio spectrum. This would prevent our spectrum from being re-allocated to commercial users, and allow for bandwidth expansion to accommodate larger limits for modern digital modes.

3. Amateur Radio Emergency Communications Enhancement Act

If elected, the Amateur Radio Emergency Communications Enhancement Act would authorize registered non-profit clubs that provide emergency communications to get access to apply for grants through FEMA and DHS, while requiring FEMA and state EMA's to include trained and licensed amateur radio operators in their disaster response plans. I would also introduce a tax credit for licensed operators who purchase equipment that will be used for emergency communications. After seeing how vital amateur radio was during the response to Hurricane Helene, I do not know how WNC would be able to recover from a disaster like that. Ham radio saved lives!

This nation is facing a major crisis in the political field, and that is the divide between the left and the right. At the end of the day, we need to love our neighbors and put this major fight to the side to get things done! I want to protect the rights of my constituents and every amateur radio operator in this great nation! One major key point I want to bring up is that I am running for a federal office, meaning I have direct input on the laws the FCC must follow. Not just a state representative or senator, but federal which will benefit every ham radio operator!

More information about Austin Ayers campaign can be [found on his website](#).

Per [Ballotpedia](#):

Austin Ayers (Republican Party) is running for election to the U.S. House to represent North Carolina's 3rd Congressional District.

WX3SVR had me at:

... allow for bandwidth expansion to accommodate larger limits for modern digital modes

But also (?)

... expand the amateur radio spectrum.

Interesting! I may reach out to WX3SVR to learn more about his specific perspective on both of those points.

I would have been skeptical of such a direct approach to ask for votes (and campaign contributions) from Amateur Radio Operators... until the surprising effect that Representative Debbie Lesko had in pressing the "Symbol Rate Issue". See **Zero Retries 0114** - Instructive Exchange Between Representative and FCC Chair for more details.

If elected, perhaps Representative Ayers could "unstuck" some needed regulatory reform for Amateur Radio at the FCC, such as removal of symbol rate limits and bandwidth limits on VHF / UHF spectrum as well as the previous reform for HF.

Leave a comment

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Comments Summary From Previous Issue

Comments from Zero Retries 0214

- Using AREDN on 902-928 MHz
- Discussion of Forward Error Correction (FEC)

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The [Zero Retries Store](#) is now open for business with quality Zero Retries branded merchandise and items being retired from Steve's N8GNJ Labs.

These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham ([The City of Subdued Excitement](#)), Washington, USA, and linked to the Internet via [Starlink Satellite Internet Access](#).

See the **Zero Retries Boilerplate** page for significant acknowledgements and other information relevant to Zero Retries. For new readers of Zero Retries,

that page, and the **About Zero Retries** page has useful information to check out.

My ongoing *Thanks* to:

Tina Stroh KD7WSF for, well, *everything!*

Jack Stroh, Late Night Assistant Editor Emeritus

Shrekky Stroh, Late Night Assistant Editor In training

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Keywords for this Issue

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Amateur Radio, **Data Communications**, AMSAT-CA, Austin Ayers, **Digital Communications**, **Digital Voice**, Don Rotolo, **DV**, Future Systems Skunkworks, **Ham Radio**, KA9Q, ka9q-radio, LinHT, Linux Handie Talkie, Meshtastic, N2IRZ, **N8GNJ**, **Packet Radio**, Phil Karn **Radio Technology**, **Software Defined Radio**, **Software Defined Receiver**, Steve Stroh, WX3SVR, **Zero Retries**, **Zero Retries Digital Conference**, **ZRDC 2025**

*Keywords in **Bold** are regular mentions in each issue.*

Footnotes for this Issue

To see the relevant sentence for the footnote, just click the footnote number.

[1](#)

The 20th anniversary / birthday of the USRP will be celebrated at GRCon 2025.

[2](#)

This is why AREDN's change from using OLSR mesh networking to Babel mesh networking is such a big deal. Babel is much less "chatty" and thus much more of the available bandwidth in an AREDN network is available for user traffic when Babel is used.

[3](#)

In commercial use of LoRa, typically a LoRaWAN relay / gateway node incorporates Internet connectivity and will be a *commercial* network, which then requires a (paid) subscription to use LoRaWAN relay / gateway nodes.

[4](#)

In brief research, *Meshtacular* is an entirely fictional name.

[5](#)

Yes, there could be an out-of-band notification such as a secondary Internet connection, but that makes it a bit too easy to focus on the Internet rather than the radio aspect.

[6](#)

And the unfortunate side effect of a disappointing experience with a portable radio is “Oh, this Amateur Radio stuff doesn’t really work all that well, so I’m probably better off not investing any more time and money into it”.

[7](#)

It's maddening... and completely counter-productive to AMSAT's stated mission of keeping Amateur Radio in Space that they choose to hide information like the details on this new version of PACSAT behind the AMSAT membership paywall. I really, really wish there was a way to convince AMSAT's management that such practices just don't work at scale in the 21st Century.